

User Guide

& Installation Instructions

USB Power Sensor PWR-SEN-6G+



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Installation Instructions and User Guide

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Installation Instructions and User Guide

Power Sensor PWR-SEN-6G+

Introduction

Traditionally, when you want to measure power of a signal source like an oscillator, frequency generator, mixer output or an amplifier you normally think of a bulky and expensive bench top power meter for the task. Not any more. Mini-Circuits' has developed a Universal Serial Bus (USB) enabled Power Sensor PWR-SEN-6G+ that breaks away from that norm. In conjunction with a power data analysis software, the PWR-SEN-6G+ (**Figure 1**) turns your laptop or desktop PC into an RF/Microwave power meter for measuring power of continuous wave (CW) signals from 1 MHz to 6 GHz.



Figure 1: Mini-Circuits' USB Power Sensor PWR-SEN-6G+ with a 50 Ohm type N (male) connector and a type N to SMA male adaptor

Capable of measuring true average power levels from -30 dBm to +20 dBm for signals in the 1 MHz to 6 GHz frequency range, the PWR-SEN-6G+ offers a low cost replacement solution for conventional RF/Microwave power meters with the benefits of data storage, portability, post processing and Internet connectivity. Plus, unlike conventional bench top instruments, no external power supply is needed and it does not require any reference signal calibration. As a result, it offers lighter weight, and makes field operation and installation easy and simple. For attachment to a device under test (DUT), it offers a 50 Ohm N-type (male) connector. Additionally, for connection flexibility, it also comes with a Type N to SMA male adaptor (**Figure 1**). While the USB interface cable connects the power sensor to a notebook or a PC with USB ports. In essence, it provides an easy plug-and-play USB connectivity to a PC. And, thereby, eliminates the need for a separate conventional power meter.

Performance

Features

- Operating frequency range of 1 MHz to 6 GHz
- 50 dB dynamic range, -30 dBm to +20 dBm
- Good VSWR, 1.1:1 (typical)
- Accuracy: ± 0.15 dBm (typical)
- Linearity at 25 C is ± 0.1 dBm (typical)
- Measurement speed is 200 ms
- No calibration after powering on (plug-in and measure)
- No external power supply is needed
- 16 simultaneous testing channels
- Temperature compensated
- Fully loaded power data analysis software
- Averaging of measurements
- Scheduled data recording
- Multi-Sensor support
- Interface with test software

Key system requirements for the sensor are shown in **Table 1**. While absolute maximum power ratings are given in **Table 2**.

Table 1: System requirements

Parameter	Requirements
Interface	USB 1.1/USB 2.0
Host Operating System	Windows 98, Windows XP, Windows Vista , Windows 2000
Hardware	Pentium III or higher, RAM 512 Mb, USB port

Table 2: Absolute maximum ratings

Parameter	Ratings
Operating temperature	0 °C to 50 °C
Storage temperature	-30 °C to 70 °C
Current (via host USB)	40 mA (+5 V)
DC voltage at RF port	15 V
CW power	+ 23 dBm

Software Features (Power Meter)

User friendly, easy to install software, enables the user to record data and present it by:

- Power Output vs. Time graph

- Text file

- Excel spreadsheet file

Measurements can be performed according to a time schedule defined by the user.

The software also offers an option to define minimum and maximum limits of measurements, defining ranges of interest, so that any deviation from defined limits is recorded and marked with a tracer:

Power Output vs. Time graph will have red lines on the Power axis at defined limits.

Excel and Text files: any result which exceeds limit will be marked by an asterisk “*”.

Getting Started...Software Setup

Insert the Mini-Circuits USB power sensor installation CD into the CDROM device.

If installation does not start automatically, run install.exe from <CD drive> root directory.

The Installation Window will appear, see Figure 2.



Figure 2: Installation Window

Click on the “Install Now” box. Accept the license agreement and click continue, see Figure 3.



Figure 3: License agreement

Getting Started...Software Setup (continued)

The installation program will launch, to install Click on"OK" in the "Mini-Circuits USB Power Meter Setup" message box, see Figure 4.



Figure 4: Mini-Circuits USB Power Meter Setup Window

The default directory for the program setup is "C:\Program Files\USB Power Meter\". Click on 'Change Directory' if you want to install under a different directory. Click the setup button to begin the installation of the USB Power Sensor. See Figure 5.

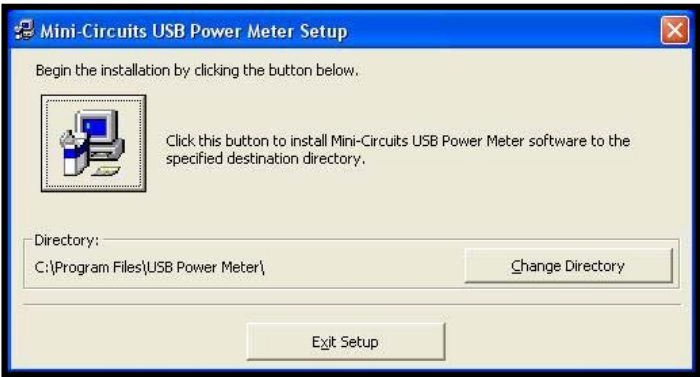


Figure 5: Setup Window

The Program Group message box will appear and you may change the Program Group name or leave it as "Mini-Circuits USB Power Meter". Click on "Continue" to proceed, see Figure 6.

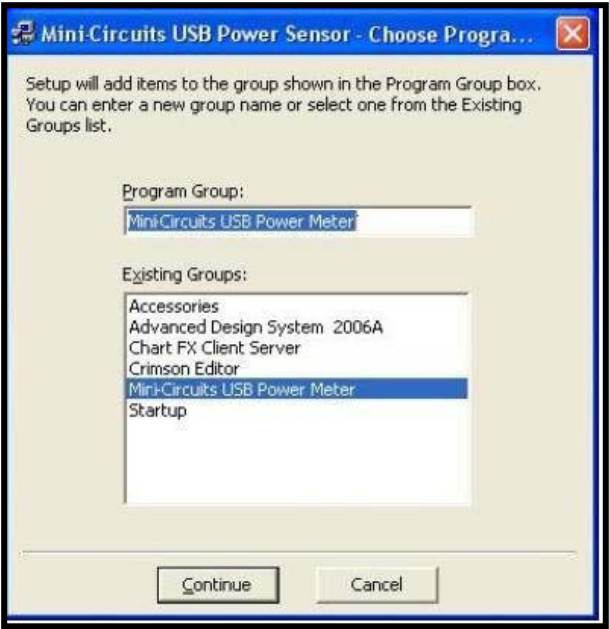


Figure 6: Program Group Window

You have completed the Mini-Circuits USB Power Meter setup successfully,Click "OK", see Figure 7.



Figure 7: Mini-Circuits USB Power Meter Setup complete

Installation of USB Power Sensor Hardware

With the Mini-Circuits USB power sensor installation CD into the CDROM device. Connect the power sensor to the PC USB port. The New Hardware Wizard window will appear, Select “No, not this time” and Click Next to continue, see Figure 8.



Figure 8: Found New Hardware Window

The “Welcome to the Found New Hardware Wizard” window will appear, Select “Install from a list or a specific location (Advanced)” and Click Next to continue, see Figure 9.



Figure 9: Found new Hardware Wizard window

The Found New Hardware Installation Options window will appear: see Figure 10.

Select the first option: “Search for the best driver in these locations.”
Click and CLEAR the check mark in the “Search removable media (floppy, CD-ROM...)” box.
Click and Check “Include this location in the search:” box.
Click on Browse to choose location of the drivers for the Mini-Circuits USB Power Sensor on the installation CD, <drive>:\drivers (where <drive> is your CD-ROM drive letter, for example; ‘ D:\drivers’). Click Next to continue.

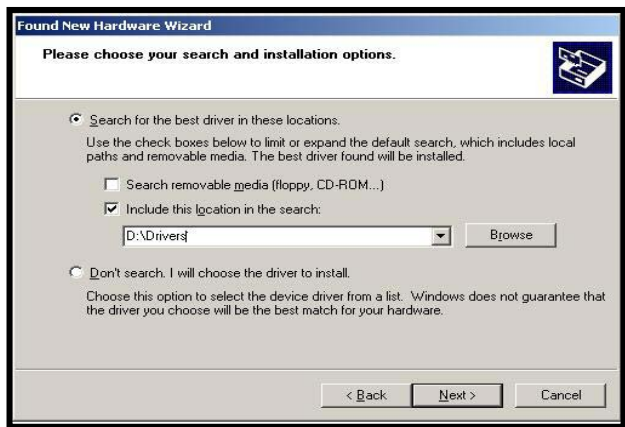


Figure 10: Found new Hardware Wizard Installation Options window

A Hardware Installation warning window will appear, Click on “Continue Anyway”,see Figure 11.



Figure 11: Hardware Installation warning window

The installation of the USB Power Senor drivers is complete, Click on “Finish” to close the wizard.

Measurement Instructions

After installation of the software and driver for activating the Power Sensor, measurements can be run.

Connecting the Power Sensor

Plug the push-pull connector in to the end of the USB Power Sensor.

Plug the USB connector in to the USB port on the computer.

Run the Mini-Circuits USB Power Meter software.

In few seconds the main screen will appear, see Figure 13, and the Power Meter is immediately available for measurements.

For achieving maximum accuracy, input your desired Frequency in the Freq (1-6000MHz) box. Upon entering the Frequency in this window the results, with respect to this Frequency, is instantly shown and without the need to click any button to restart testing or refresh the screen.



Figure 13: Power Meter Software Main Screen

Recording Data

For recording data, click on the “Record” box and another window will open, “Power Meter - Recording”, see Figure 14. There are two recording options;

- 1.Start Record Now: Test data will start to be recorded immediately. The Record box on the main screen will change to “Recording” and turn red. To stop recording, click on “Stop Record Now”.
- 2.Start Record According Schedule. Test data is recorded according to the time period defined at the “Start Record At” settings. The “Record Interval” setting changes the time period between recording data points and can be set from a minimum of 1 second to a maximum of 999,999 hours. When the start date is set for a future time, the “Record” box on the main screen Changes to “Record (Stand by record)” and color changes to yellow until the recording begins. At that time the box will change to “Recording” and color will change to red.

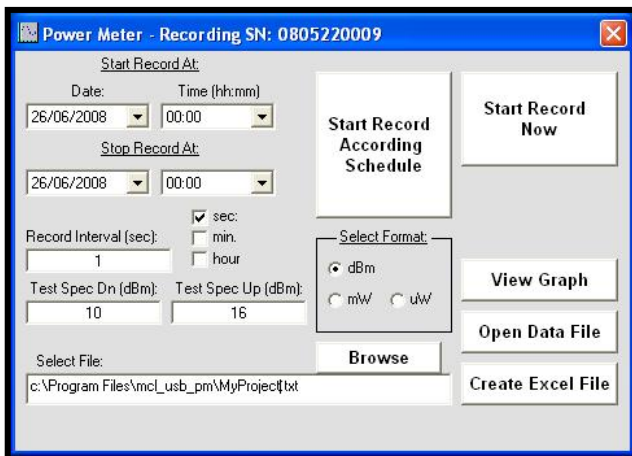


Figure 14: Power Meter Recording window

Specification Limit Settings

Upper and lower test power results limits may be defined in the “Test Spec Dn” (lower limit) and Test Spec Up (upper limit). Data point deviations from these limits are indicated on the recorded test results report.

Power Measurement Results Format

The results may be displayed in dBm, milliwatts (mW), or microwatts (uW).

Data Output

Upon completion of recording, data results may be displayed by clicking: View Graph, Open Data File, or Create Excel File. See Figure 14.

Power vs. Time Graph

Upon clicking “View Graph”, a graph appears, see Figure 15, that shows power changes vs. time. Since the Power Meter contains a temperature sensor, it is also possible to show the temperature in the Power Sensor body vs time on the graph. This is to allow the user to correlate between Power measurements and temperature. To display the temperature on the graph, check mark “ “ the “Show Temperature Graph” box.

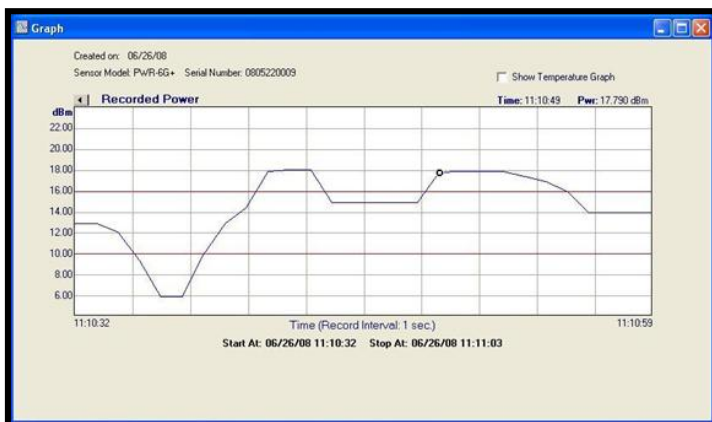


Figure 15: Power Meter – Data Graph window

Text Data File

Upon clicking “Open Data File”, a text file window will appear with the recorded data, see Figure 16. The data record options defined by the user will be shown on this text file, for example Date, Time, Frequency, upper and lower Power limits, Temperature. Data results which are outside of the upper and lower Power limits defined will be marked with an asterisk “*”.

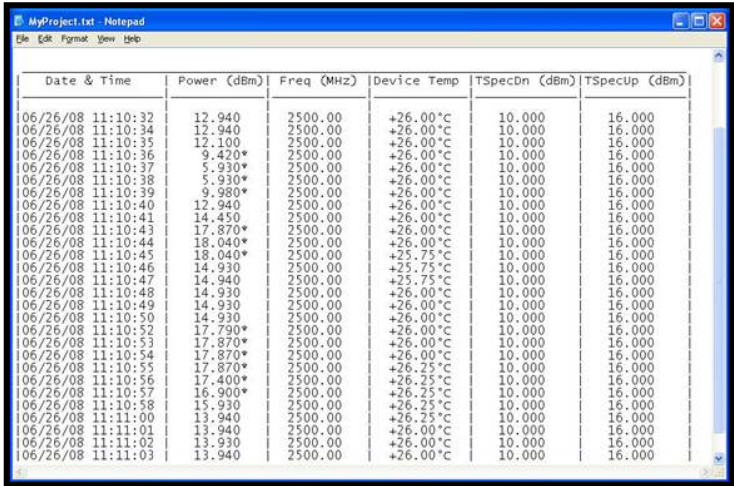


Figure 16: Power Meter – Text Data window

Excel Spread Sheet File

Upon clicking the “Create Excel File”, an Excel spread sheet will appear, see Figure 17. The data on the Excel sheet is displayed in a similar format to the Text File (Open Data file). Note that the computer used must have the Excel software installed.

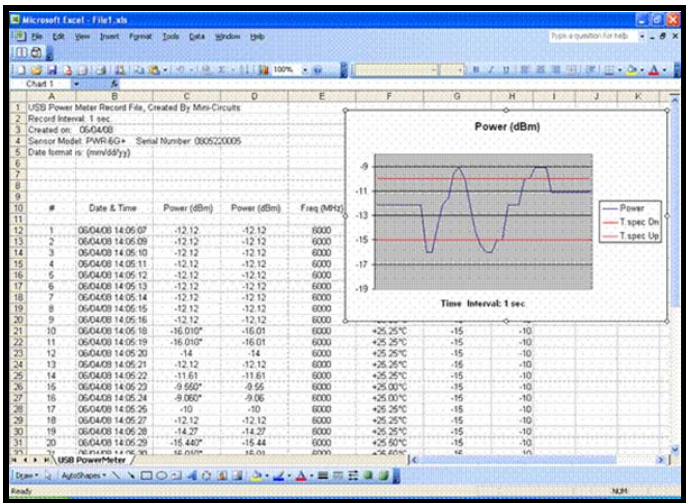


Figure 17: Power Meter -Excel Data window

Additional Power Meter Software Features

Data Averaging: In cases when the measured signal is not stable, it is possible to display the test result based on the average of a number of measurements. The number of measurements that the averaging is base is defined by the user. A check mark “√” is put in the “Averaging” box, see Figure 18, and number of readings is typed into the “Avg. Count” window. The result is displayed after the first average is calculated and the following calculated averages are presented as testing progresses.



Figure 18: Data Averaging

Relative: This feature allows the user to make a measurement relative to a previous data reading. A check mark “√” is put in the “Relative” box, see Figure 19. This enables saving a reading and then the main screen result of each additional reading will be relative to the saved reading. The result will be presented in dB.

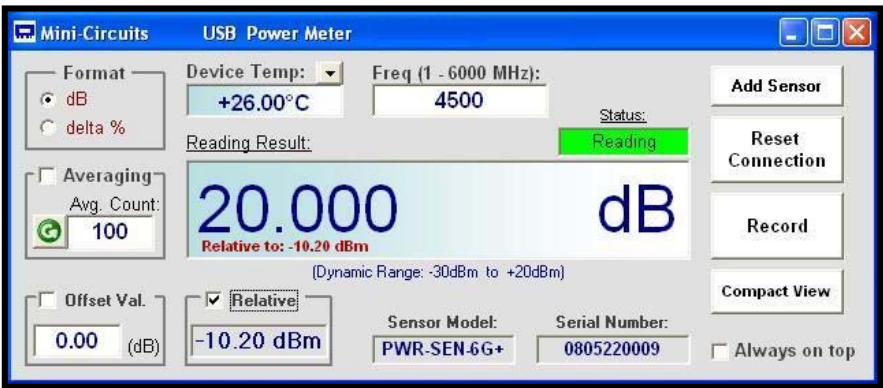


Figure 19: Relative readings result

Offset Value: This feature allows the user to adjust the readings to compensate for external Attenuation on the line being tested. A check mark “√” is put in the “Offset Val.” box, see Figure 19, and Attenuation offset value is typed into the “Offset Val.” window.

Reset Connection: If the Power Sensor is unplugged from the USB port, to continue taking readings, the Power Sensor should be plugged back into the USB port and click the “Reset Connection” box, see Figure 19.

Add Sensor: This feature allows the user to work with more than one Power Sensor with the same computer. While testing with one Power Sensor another Power Sensor may be added by plugging the additional Power Sensor into a USB port and click the “Add Sensor” box. A list of Power Sensors connected to the computer will appear (listed under the Power Sensor serial number), see Figure 20, the user should choose the appropriate Power Sensor.

Working with Multiple Power Sensors: In case the user works with more than one Power Sensor, the software identifies all the Power Sensors connector to the computer by the Power Sensor serial number and presents a list of Power Sensor, see Figure 20.

Selecting Power Sensors: The user will select the desired Power Sensors per the serial number.

To use all Power Sensors connected, click “Select All”.

To use each of the Power Sensor at a different test frequency, the **user must** input the desired frequency for each Power Sensor on the Main Screen (corresponding to each Power Sensor). For ease of use, place a check mark “√” in the “Compact View” box, see Figure 20.

Software Interfacing: Interfacing with test software for Power Sensor remote control can be done easily. On the disc supplied in the folder, **DLL_ActiveX** there is a file, **mcl_pm_dll_ReadMe.txt**. This has programming instructions and an example. The library file, **mcl_pm.dll**, is located in the same directory.

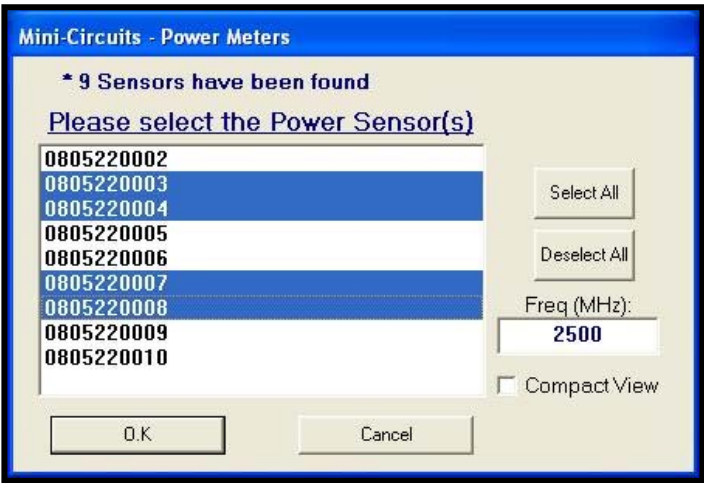


Figure 20: List of Multiple Power Sensors connected to computer

Compact View

The Compact View allows the user view the serial number of each Power Sensor, Frequency, and Power reading, see Figure 21.

To change the Frequency of one of the Power Sensors, click on the screen and a full screen view will be shown, where the relevant Frequency may be changed.

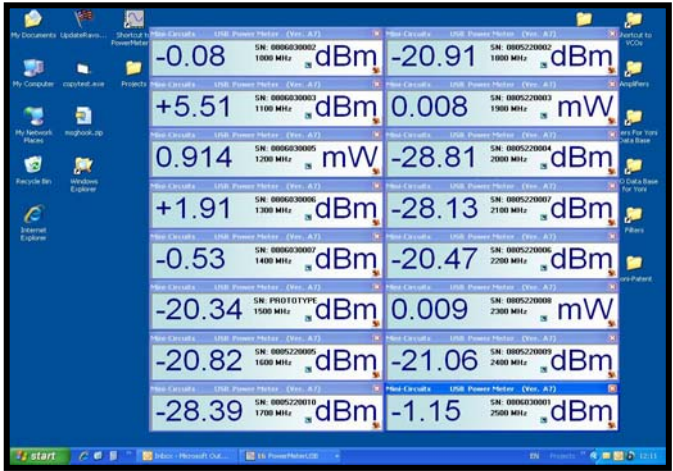


Figure 21: Compact View windows

Multiple Power Sensors

Multiple Power Sensors may be connected to a computer by using USB Hub. We recommend using a maximum of a 4-port Hub per computer USB port, see Photo 1. To use 16 Power Sensors with one computer, four 4-port Hubs should be used, for reference see Figure 22.



Photo 1: Example of 4 port USB Hub

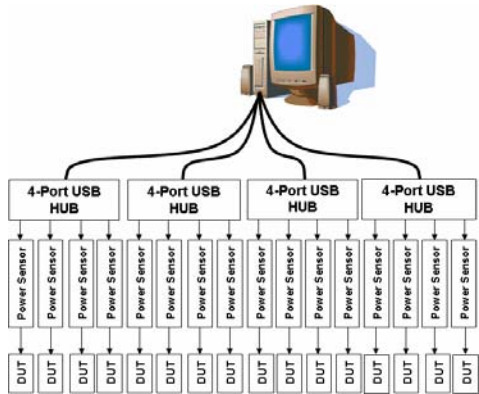


Figure 22: Connection Diagram for 16 Power Sensors

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